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SPECIFICATION

1. Title of the Invention: INFORMATION DISPLAY APPARATUS

2. Claim

An information display apparatus comprising display means for displaying information; a plurality of input means for applying a prescribed processing to information displayed by said display means; indicating means which are provided in correspondence to each of these plurality of input means and indicate a part of the information displayed on said display means; and means which displays by discriminating indicating means in activation from the other indicating means from among the plurality of indicating means.

3. Detailed description of the Invention

[Object]

(Technical Field of the Invention)

The present invention relates to an information display apparatus which has, for example, a plurality of consoles and in which information displayed on a common display apparatus is processed from the individual consoles.

(Description of the Related Art)

As apparatuses for displaying characters or graphics at a conference or other place for presentation, there are available, for example, an electronic blackboard, an electronic OHP (Overhead Projector) and the like. The conventional electronic blackboard reads out information shown on a board by means of a reader, and outputs the read information onto paper by the use of a copying machine. In an electronic OHP, information stored in advance is projected onto a board for display. The conventional electronic blackboard or electronic OHP has had only very simple functions as described above.

More recently, therefore, an information display apparatus permitting direct input of information including characters and graphics electronically on a board and display after editing is under development. In such an information display apparatus, input of information can be carried out not only directly from the board surface, but

also from outside. The thus entered information is displayed on the board as image information, can further be edited and processed in various manners. This information display apparatus can be connected to a plurality of consoles (terminals), apart from a main body integrally connected to the board. Processing of the information displayed on the board is conducted, not only through the main body, but also from the individual consoles. In a conference or the like, the information on the board can be processed by the individual participants who operate the distributed consoles from their seats. The conference or a presentation can be conducted smoothly by thus processing the information.

When holding a conference by using the above-mentioned information display apparatus, a presenter causes display of a marking bar on the display screen as shown in Fig. 31, and he presents his paper while indicating the information on the display screen with this marking bar. At this point in time, marking bards of the other participants not making a presentation are still displayed on the display screen. If the marking bar of the presenter cannot be clearly discerned from the other marking bars, it would be difficult to understand what point the presented is indicating, and this may prevent his intention from being communicated.

(Problems to be Solved by the Invention)

As described above, in the conventional information display apparatus having a plurality of input means (consoles), discrimination between an indicating means in activation (marking bar of the presenter) and indicating means in inactivation (marking bars of participants other than the presenter) had the risk of being unclear.

The present invention has therefore an object to provide an information display apparatus which always permits easy understanding of the position of indicating means in activation by discriminately displaying indicating means in activation and indicating means in inactivation.

[Construction of the Invention]

(Means for Solving the Problems)

The information display apparatus of the present invention comprises display means for displaying information; a plurality of input means for applying a prescribed processing to information displayed by the display means; indicating means which are provided in correspondence to each of these plurality of input means and indicate a part of the information displayed on the display means; and means which displays by discriminating indicating means in activation from the other indicating means from among the plurality of indicating means.

(Operation)

The information display apparatus of the present

invention has a plurality of input means, and indicating means for each of these input means. Display is performed so as to permit easy visual discrimination between indicating means in activation and indicating means in inactivation from among these indicating means.

(Embodiments)

An embodiment in which the present invention is applied to an electronic information blackboard will now be described in detail with reference to the drawings.

Fig. 1 is a block configuration diagram of the electronic information blackboard of this embodiment, and Fig. 2 is an exterior view. The electronic information blackboard of this embodiment comprises a main board A serving as the main body of the apparatus, and a console B serving as a terminal device. To begin with, the configuration of the main board A will be described. A display unit 1 and a coordinate input unit 2 are arranged in close contact as shown in Fig. 3 (t e main board as viewed from back). The display unit 1 comprises, for example, a liquid crystal display, a plasma display or the like. The coordinate input unit 2 is composed of a transparent pressure-sensitive tablet, a magnetic tablet or the like. The display unit 1 is therefore visible through the coordinate input unit 2. When a user writes image information into the coordinate input unit 2 by means of an

input pen 15, image information written as an X-Y coordinate value from an origin assumed to be positioned, for example, at the left top end of the coordinate input unit is obtained. In this case, the input pen used for writing does not require physical image forming means such as ink. The tip of this input pen 15 is rounded to some extent so as to avoid damages to the coordinate input unit 2. The thus written image information is converted into an X-Y coordinate value, and incorporated into a main CPU 3 in match with the clock frequency. The image information incorporated into the main CPU 3 is transferred to a display memory 5, and stored as data. When displaying the image information entered and stored as data, it is displayed at a position corresponding to the X-Y coordinate of the coordinate input unit 2 upon writing on the display unit 1 in accordance with the date of the X-Y coordinate value stored in the display memory 5. Upon writing the image information into the coordinate input unit 2, the above-mentioned image data is written in the above-mentioned method, and simultaneously, displayed on the display unit 1 at a position corresponding to the coordinate input unit 2. The entered image information is therefore displayed on the display unit 1 as if it were written in ink or the like. The display memory 5 has a capacity for a plurality of pages and its function is not limited to storage of the image

information written in the coordinate input unit 2 as described above. The display memory 5 can store various image data including image data of image information read in a scanner 10, image data read in from an FDD (Floppy Disk Drive) 8, and image data transferred via a communication interface 17. The scanner 10 reads out image information recorded on paper or the like such as a photograph or a drawing. The read image information is stored in the display memory 5 via the scanner interface 9. On the other hand, the image information stored in the display memory 5 is outputted onto a recording medium such as paper from a hard copy machine 12 via a hard copy interface 11. Furthermore, the electronic information blackboard of this embodiment can be connected to other workstations such as personal computers. When exchanging image information with other workstations, offline information exchange is carried out via a floppy disk. It is also possible to cause an FDD derive 8 provided in the electronic information blackboard of this embodiment to read out a floppy disk recording image information prepared by the other workstation. The read image information is stored in the display memory 5 via the FDD interface 7. In contrast, image information stored in the display memory 5 can be recorded on a floppy disk by use of an FDD device 8. When exchanging image information with other workstation online, it is accomplished via a

communication interface 13 and a communication network 14. More specifically, the image information received through the communication network 14 is stored on the display memory 5 via the communication interface 13. It is similarly possible to send online the image information on the display memory 5 to the other workstation.

In a presentation, it is sometimes effective to use, not only visual information, but also aural information. Voice information serving as aural information is outputted from a speaker 17 via an audio interface 16. The audio interface 16 analog-converts digitized data such as voice or music entered, for example, from a microphone via a D/A converter (not shown), and outputted to the speaker 17 further through an amplifier (not shown). In this case, the information such as character data may be converted into digital aural signals through a regular synthesizer (not shown) or the like and entered into the above-mentioned D/A converter.

An image arithmetic unit 6 applies a processing such as affine conversion of enlargement/reduction or arithmetic operation between images by use of the image bus to the image information stored in the display memory 5, and processes the image information displayed on the display unit 1. This makes it possible to reduce image information in size for a plurality of pages stored in the display

memory to a specified size for each page, and move it to a specified coordinate position on the display unit 1, thus permitting display of pieces of image information for a plurality of pages at a time. The information display apparatus of the present invention has the window function of displaying pieces of image information for a plurality of pages one on top of the others.

The memory 4 attached to the main CPU 3 is a memory space used in processing for various types of operation as described above, and is allocated to the individual areas for each operation as shown in Fig. 4.

Operations in the electronic information blackboard of this embodiment are performed not only by the main board A alone, but also can be conducted also by consoles B. The configuration of the console B will now be described. The console B communicates with the main board A via console interfaces 18 and 19, and carries out, for the main board A, processing entered through the keyboard 21, the mouse 24 and the coordinate input unit 22. The display unit 20 comprises a liquid crystal display, a plasma display or the like, and can display the same contents as those displayed currently on the main board A.

Each console has a display memory 25 having a capacity for a plurality of pages, and information displayed on the main board A is stored in the display memory 25. Even when

the same contents as those displayed on the main board A are displayed, the contents are once stored in the display memory 25 and then displayed. The details of this display memory 25 will be described later. Control of the console B itself is performed by the CPU 23 mounted on the console B. Control of an instruction issued from the console B to the main board A is conducted by the main CPU 3 mounted on the main board A. A plurality of consoles B having such a configuration are connected to the main board A, and have the construction as shown in the system configuration view of Fig. 5 as a whole.

Actual operations of the electronic information blackboard of this embodiment will now be described. As described above, the electronic information blackboard can be operated by the main board A and the consoles B annexed thereto. Operations from the main board A will be described. The display unit 1 has a menu area 61 as shown in Fig. 6. The user selects a desired menu by designating the position of a desired menu by means of the input pen 15. The main CPU 3 executes processing in accordance with the selected menu. The area other than the menu area 61 displayed on the display unit 1 is a display area 62 for actual image information. Characters or graphics can be freely written with the input pen 15 into the display area 62. Write can be performed in any of two modes including a recognition

mode and a drawing mode. In the recognition mode, characters or symbols are recognized through stroke analysis of coordinate information of characters and symbols entered by a coordinate input unit 2. Subsequently, the recognized characters or symbols are converted into corresponding code information. The characters or symbols thus recognized and converted into code information are converted one after another into patterns of characters and symbols stored in advance in a character generator in correspondence to the code information. As a result, the entered and recognized characters and symbols, treated as code information, can be handled by the wordprocessor function. In the drawing mode, graphics are written with a line width and in a color prescribed in the display memory 5 in accordance with coordinate information entered from the coordinate input unit 2. On the display unit 1, image information is displayed as it is entered.

On the other hand, operations carried out from the console to the electronic information blackboard are accomplished as follows. An operation menu similar to that of the main board is displayed on the display unit 20 of the console B, and the user selects a menu by means of a keyboard 21, a mouse 24 or a coordinate input unit 22. Upon this selection, the CPU 23 of the console transmits code information corresponding to the selected menu to the main

board. In the main board, on the other hand, the main CPU 3 performs processing of the image information on the main board in accordance with the code information. Write from the console is also in any of a recognition mode and a drawing mode. If the recognition mode is selected, characters or symbols are recognized from coordinates obtained by the coordinate input unit 22, as in the main board, and transmitted as code information to the main board. Characters or graphics can be entered directly by means of the keyboard 21 by use of the wordprocesssor function provided in the console itself. In the drawing mode, on the other hand, the coordinate information is transmitted as it is to the main board. The marking bar described later on the main board can be moved by use of the mouse 24 connected to the console. The marking bar can specify any place on the display screen.

The image information on the display unit 1 may be batch-erased or partially erased by area specification. In the partial erasure by area specification, two points on the display screen are specified, and a rectangular area having the line connecting these two points as a diagonal is partially erased. By determining an act of causing an eraser having a shape similar to that of a blackboard eraser to slide on the image information displayed on the display unit 1 from the pressure-sensing area of the coordinate

input unit 2, an image within the pressure-sensing range can be erased. The operation in the erasure is just reverse to writing operation. More specifically, while upon writing image information as described above, an image is displayed on the pressure-sensing portion, upon erasing by an eraser, an image within the pressure-sensing portion is erased.

In the above-mentioned electronic information blackboard, operations can be carried out through a plurality of consoles. In this case, if all the consoles can be equally operated, many consoles may issue operating requests at a time for writing onto the blackboard or operation of marking bars. For example, when using the electronic information blackboard in a conference, the chairman makes adjustments to ensure smooth progress of the conference. For this purpose, in the electronic information blackboard of this embodiment, a console for the chairman is selected from among the plurality of consoles (the selected console is hereafter called a center console - second input means -) and the center console is imparted the role of controlling the other consoles (hereafter called sub-consoles - first input means -) A conceivable manner of selecting a center console is to select a console into which a prescribed key is first entered after power-on. The flow of selection of this center console itself will b described by means of the flowchart shown in Fig. 7. It is assumed

here that there are consoles Nos. 1 to 8. The first step is to determine whether or not to adopt sequentially from console No. 1 by substituting 1 for the argument n representing the console No. (Step 1). Then, it is determined whether or not an input for deciding a center console has been made for console n (Step 2). Thereafter, it is determined whether or not an input for deciding a center console has been made for the next console by substituting a value obtained by adding 1 to n for n (Step 3). At this point in time, it is determined whether or not 8 has been reached by n since the number of consoles is 8, i.e., whether or not all the consoles have been checked up (Step 4). If it is determined that all the consoles have been checked up, the process returns back to Step 1 to repeat the above-mentioned processes until a center console deciding input is made for any of the consoles. If a center console deciding input is made for console n in Step 2, the main CPU 3 (shown in Fig. 1) adopts console n as the center console (Step 5), thus completing the center console deciding processing. Information of the center console decided as above is stored as bit information of "0" and "1" in the center console setting area 41 in the memory 4 (shown in Fig. 4) as shown in Fig. 8. In the case shown in Fig. 8, the console 2 is set as the center console. The main CPU (shown in Fig. 1) determines, for operation requests from

the individual consoles, whether an operation request is from the center console or from a sub-console, with reference to the center console setting area 41 and performs processing corresponding to an appropriate case.

As described later, the center console is not subjected to any limitation and has a higher priority than any other console. In the setting screen of limiting conditions shown in Fig. 9 and in the setting screen of priority shown in Fig. 12, "C" is displayed for a console set as the center console to discriminate it from the other consoles.

Upon decision of a center console through the flow as described above, a setting screen of limiting conditions is displayed, following the display screen of the center console. Then, upon the completion of setting of limiting conditions, a setting screen of priority is displayed. "Setting of limiting conditions" and "setting of priority" will now be descried in detail. Setting of limiting conditions is accomplished on a display screen as shown in Fig. 9, and covers write on the screen, control of the display screen, and operation of the marking bars. In this setting of limiting conditions, it is set whether or not to allow use of each console for write into the screen, control of the display screen, and operation of the marking bars. The actual practice of setting of limiting conditions for each console will not be described with reference to the

flowchart shown in Fig. 10. A console to be subjected to setting is first selected (Step 1). It is assumed here that console No. 4 is selected. Then, the area for console No. 4 is reverse-displayed as shown in Fig. 9. Then, setting is made regarding write onto the screen for this console No. 4 (Step 2). Then, setting as to control of the display screen (Step 3) and setting regarding operation of the marking bars (Step 4) are accomplished. Then, it is determined whether or not setting has been completed for all the consoles (Step 5). If setting has not as yet been completed for all the consoles, the process returns back to Step 1, and Steps 1 to 5 are repeated until setting is completed. When setting for all the consoles has been completed, the setting menu of limiting conditions comes to an end. As shown in Fig. 9, when the corresponding portion of the console No. and the limiting conditions is marked "x", that console is in a limited state. When the corresponding portion is marked "o", the console is in a state not limited. That is, if consoles are in the state shown in Fig. 9, consoles Nos. 3 and 7 are not allowed for write on the screen. Information about the limiting conditions set as described abode is stored in a bit-state expressions including: limited = "1", and not limited = "0", as shown in Fig. 11 in an area corresponding to each console of the limiting conditions setting area 42 of the memory 4 (shown in Fig. 4).

Upon the completion of setting of limiting conditions as described above, the screen is switched over to the screen of setting of priority as shown in Fig. 12. Setting of priority is conducted on the display screen shown in Fig. 12, and a priority for a console is set for write into the screen, control of the display screen, and operation of marking bars. For example, when there are eight consoles as in the case shown in Fig. 12, the priority is specified by numbers 1 to 8. A smaller number is imparted to a console which has received a setting "limited" upon setting limiting conditions. A sign "-" is displayed in a corresponding portion of the subject console. The actual flow of setting of priority for each console is similar to the flow described as to setting of limiting conditions as above. Description thereof is therefore omitted here. The priority information thus set is held in areas corresponding to the individual consoles of the priority setting area 43 in the memory 4 (shown in Fig. 4) as shown in Fig. 13. The process up to the execution of processing in a case where an operation is specified from a console will now be described here in accordance with the flowchart shown in Fig. 14. It is assumed that a request for an operation is issued from console N having a priority n to the main board (Step 1). It is determined whether or not there is a request for an operation from other console within a prescribed period of

time (Step 2). If there is no request for operation from other console, the right of operation is given to console N, and the operation requested by console N is executed (Step 6). Upon the completion of the operation for console N, the right of operation for console N disappears based on a prescribed completion signal from console N (Step 7). If there is a request for an operation from other console within a prescribed period of time in Step 2, the priority m of that console M is read out (Step 4). Then, the priority n of console N and the priority m of console M are compared (Step 5). When the value of n is smaller, the operation requested by console N is executed (Step 6). On the other hand, if the value of m is smaller in Step 5, the request for operation from console M is selected. N is replaced by M, and n by m, respectively (Step 3), and the process returns again back to Step 2. Then, when there occur requests for operation from other consoles within the prescribed period of time before execution of an operation based on a request for operation from a console, the request having the highest priority (i.e., having the smallest value of priority) from among the plurality of consoles issuing the requests for operation is selected and executed.

By setting limiting conditions and a priority for each console as mentioned above, it is possible to avoid execution of requests for different operations issued by a

plurality of consoles simultaneously for the image information, and when it is used for a conference, to ensure smooth progress of the conference.

When operations are carried out for a plurality of consoles in an electronic information blackboard having the above-mentioned configuration, image information entered from a console may be erased erroneously by other console. Particularly, when pieces of image information entered from a plurality of consoles are mixed in a small area, it is necessary to pay the closest attention so as to erase only a particular piece of image information. In the electronic information blackboard of the present invention, therefore, the configuration permits erasure of only a piece of image information entered from that console by that console. However, the center console alone can erase the image information entered from any of all the sub-consoles.

Operation of displaying the image information on the display screen of each console will now be described. Each console has a display memory 25 for a plurality of pages shown in Fig. 1. The image information which has been displayed in advance on the main board is stored in a page of the display memory 25. The contents of this memory are updated every time the contents of the image information displayed on the main board are switched over. Pieces of image information entered from other consoles are stored in

the other pages of the display memory 25. The contents of this memory are updated every time image information is entered newly from the other consoles. Pieces of image information entered from that console are stored in the other pages of the display memory 25. The contents of this memory are updated every time new pieces of image information are entered from that console. By transmitting pieces of image information stored in the display memory 25 for these pages in superposition to the display units 20 of the individual consoles, the same image information as that displayed currently on the main board is available on the display units 20 of the consoles.

As described above, each console is set as the center console or a sub-console upon initialization. A console set as a sub-console can erase only the display memory storing the image information entered from that console from among the display memories. The display unit 20 of each console has the same menu area as that of the main board shown in Fig. 6. When conducting "erasure", a range to be erased is specified after selecting the "erasure" menu from the menu area by using the mouse 24. By subsequently executing erasure, only the image information entered by that console is erased from the previously specified range. Selection of "erasure" on the operation menu causes display of the erased information selecting menu shown in Fig. 15 is displayed.

At this moment, any of the pieces of image information displayed in advance on the main board, the piece of image information entered from each console, and the piece of image information entered from the main console is selected for erasure. Subsequently, the range to be erased is specified, and upon execution of erasure, the portion of the image information specified to be erased which is included in the erased range is erased.

By specifying a range to be erased from each sub-console, only the piece of image information entered from that console can be erased. Even when image information entered from other consoles or image information displayed in advance is included in the specified range of erasure, these pieces of information are never erased. When pieces of image information entered from the plurality of consoles is to be batch-erased, these pieces of information can be freely erased from the center console, without the need to erase them from the individual consoles.

When setting an area to be erased directly on the main board, specification is made with the input pen of two points on the diagonal of a rectangular area to be erased as described above. When executing erasure for this area, all the image information within this area is erased.

In the electronic information blackboard as described above, a plurality of consoles can simultaneously issue

instructions for the image information by providing marking bars in correspondence to the individual consoles. In the above-mentioned "setting of limiting conditions" and "setting of priority", limiting conditions and priority conditions set for the individual consoles are effective also for operation of marking bars. Operation of a marking bar is allowed only for a console for which operation of the marking bar is set as "no limitation" on the setting screen of the limiting conditions shown in Fig. 9 (in Fig. 9, consoles Nos. 1, 2, 4, 5, 6 and 8). Furthermore, when a plurality of consoles issue a processing request of giving an instruction by use of a marking bar for the image information, the marking bar of the console having a higher priority (i.e., a smaller value) in accordance with the priority set in the screen for priority setting shown in Fig. 12 can make an instruction as to the image information in preference to the marking bars of the other consoles. That is, even when the display screen displays a plurality of marking bars, only one among them can conduct operation, and all the other marking bars are inactivated on the display screen. The main CPU 3 (shown in Fig. 1) provided in the main board takes charge of control of these marking bars.

A special memory for displaying marking bars corresponding to the individual consoles is provided in the display memory 5 provided in the main board. Only the

information of the marking bar of a console is stored in an area for a page of this display memory. More specifically, special display memories for marking bars are provided in a number of consoles. Information about features of patterns of marking bars such as color and shape of the marking bars corresponding to the individual consoles is stored in the memory 4. The manner of setting of marking bars will be described later. When issuing an instruction by use of a marking bar for image information displayed on the display screen, the information regarding the marking bar stored in the memory 4 is fetched. Based on this information, as shown in Fig. 16, the image 70 of the marking bar is displayed on the display memory dedicated for marking bar, and is displayed in superposition over the image information 71 to be displayed. As a result, the image information 71 and the image 70 of the marking bar are simultaneously displayed on the display screen 72. That is, the marking bar can make an instruction to the image information on the display screen. In addition, for example as shown in Fig. 17, the marking bar can be moved on the display screen by continuously issuing an instruction to the marking bar display memory while moving the coordinate position of erasing and writing of the marking bar image.

In the above-mentioned manner of display, a plurality of marking bars may sometimes be displayed on the display

screen. In such a case, which console operates which marking bar may be unknown. The marking bars unique to the individual consoles are therefore displayed by setting different colors or shapes of marking bars for each console. This "setting of marking bar" is accomplished by means of images as shown in Fig. 18. For the consoles allowed to operate marking bars upon setting limiting conditions by the center console as described above (consoles Nos. 1, 2, 4, 5, 6 and 8 in Fig. 9), the "setting of marking bar "screen is automatically displayed at the moment when operation of the marking bar is allowed. This setting of marking bar is performed from the individual console in the sequence of "setting of shape" and then "setting of color". In setting of shape, as shown in Fig. 18, for example, eight kinds of shape are displayed. The user selects an arbitrary shape on the screen by means of a cursor illustrated in the form of ▲ in Fig. 18. Corresponding code information is imparted to each of the shapes displayed on the screen. The code information of the shape of marking bar selected by each console is stored, as shown in Fig. 19, in ach of the areas corresponding to the individual consoles of the marking bar shape setting area 44 in the memory 4 (shown in Fig. 4). Since a shape corresponds to a console without fail, a plurality of marking bars having the same shape are never displayed simultaneously on the display screen. Upon

selecting a shape as described above, therefore, the shape already selected by other console cannot be selected.

Upon the completion of setting of shape as described above, a color is set. In the case of color also, as in setting of shape described above, for example, eight kinds of color are displayed as shown in Fig. 18. The user selects an arbitrary color on the screen by means of the cursor represented by the mark ▲ in Fig. 18. When a color is displayed on the display unit 1 (shown in Figs. 1 and 2) of this embodiment, coloring is accomplished by adjusting the amounts of components R (red), G (green) and B (blue) which are the three primary colors. For colors set in advance described above, values of R, values of G and values of B for constituting individual colors are stored in the storing area (not shown) of the existing marking bar colors in the memory 4 (shown in Fig. 4) as code information. When colors are selected by the individual consoles, the code information for R, G and B of colors of the marking bars selected here is fetched from the storage area of the existing marking bar colors mentioned above, and stored in areas corresponding to the individual consoles of the marking bar color setting area 45 in the memory 4 (shown in Fig. 4). A color not set in advance may be requested, depending upon a special use or personal liking. In such a case, by selecting "color formation" by the cursor

represented by a mark ▲ in the setting screen of marking bar shown in Fig. 18, the display screen is switched over to a marking bar color forming screen as shown in Fig. 21. In this marking bar color forming screen, the amounts of components R, G and B constituting colors can be set freely within a range from 0 to 100%. Actual setting is accomplished by, for example, selecting first one of the components R, G and B by means of a cursor represented by a mark ▲, and then moving a bar-shaped index representing the component amount to the right or to the left. Further, the formed color is constantly displayed in a color display 81 area of the marking bar color forming screen. In this case, the color formed by the marking bar forming screen should not be the same color as that already set for a marking bar of other console. That is, it is necessary to establish at least a visual difference from the color of any other marking bar. For this purpose, within ranges in which there is no visual difference from the already set colors, a certain space of RGB is provided as a limitation area 82 as shown in Fig. 22. In the marking bar color forming screen, the portion corresponding to this limitation area 82 is reversely displayed for each component as shown in Fig. 21 to prohibit setting of a color for which the amounts of all of the three components R, G and B are within this limitation area.

The color information thus set for the marking bar of each console is stored as code information for each value of R, G and B in the area corresponding to each console within the marking bar color setting area 45 in the memory 4 (shown in Fig. 4).

Correspondence between the marking bar set for each console by the above-mentioned setting means and the console No. is always displayed at the bottom end of the display screen as shown in Fig. 23. Furthermore, by use of the character input function from the console as shown in Fig. 24, the user name of the marking bar and the corresponding console or the like may be displayed.

As shown in Fig. 25, marking bars may be displayed in superposition or a marking bar may keep part of the image information to be indicated from sight. In such a case, the image information display unit of this embodiment minimizes superposition or screening by a marking bar by rotating the marking bar as shown in Fig. 26. More specifically, a marking bar rotates to the right by 10° when the user presses a right arrow key on the keyboard, or to the left by 10° when he presses a left arrow key. By keeping processing the right arrow key or the left arrow key, the marking bar continuously rotates to the right or to the left. This rotation of the marking bar is accomplished, for example as shown in Fig. 27, by reading out an original shape from the

marking bar shape setting area 44 in the memory 4 (shown in Fig. 4), rotating it by means of the affine converting unit 90, and storing it again into the marking bar shape setting area.

If the above-mentioned procedure is carried out under the control of the main CPU, marking bars are never displayed in superposition. More specifically, the marking bar of each console is stored in a special area on the display memory (not shown) for the marking bar as described above. The coordinate information for all the marking bars is thus constantly grasped by the main CPU 3 (shown in Fig. 1). Now assume that a marking bar is in operation, and another is in stoppage. Every time the marking bar in operation moves, the coordinate information for the marking bar in the display memory is updated, and therefore, the display memory always stores the current coordinate information of the marking bars. The main CPU 3 constantly compares the coordinate information of this marking bar in operation and the coordinate information of other marking bars in stoppage, and when it finds agreement between the pieces of coordinate information, determines that the marking bars are displayed in superposition. The main CPU 3 thus determines a display in superposition, and at the same time, fetches coordinate information from the memory area of that marking bar in operation, and converts the original

pattern into a state rotated by 90° through the affine conversion unit 90 as described above for display.

At this point in time, rotation of the marking BAR causes a visual change of the marking bar, but the actual coordinate information keeps the value before the rotation. Therefore, when the coordinate information of the marking bar in operation disagrees with the coordinate information of the other marking bar in stoppage, the state of the marking bar in operation is simultaneously reversely converted into the original pattern. As a result, a plurality of marking bars are never displayed in superposition.

This permits clear recognition to which console the marking bar in operation belongs or where each console specifies.

When a presenter presents his report while indicating image information on the display screen by using the marking bar, the other marking bars remain displayed in a standstill on the display screen. If the marking bar of the presenter and any of the marking bars of the participants other than the presenter are in the same color system (for example, blue and light blue, indigo blue, etc.), this may lead to misidentification. In the electronic information blackboard of this embodiment, therefore, the marking bar of the presenter is furthermore caused to blink to attract the

attention of the audience. It is assumed here that a marking bar allowed to operate by the main CPU 3 (shown in Fig. 1) is orange-colored. The ratios of the components R, G and B on the marking bar setting screen are: R=50%, G=100% and B=100% as shown in Fig. 28(a). The main CPU 3 (shown in Fig. 1) reduces the ratios of the color components of the marking bar in operation at an appropriate timing in agreement with the clock frequency as shown in Fig. 28(b) (R=25%, G=50% and B=50%). As a result, the marking bar in operation has a brightness decreased to a half. By repeating this operation, the marking bar in operation blinks. Thus, the marking bar of the presenter can easily be discriminated from the other marking bars.

Discrimination of the marking bar of the presenter from the other marking bars becomes clearer in the following example. It is effective, as shown in Fig. 29, to cause the marking bar a of the presenter to have a direction other than the direction of the other marking bars b,...; or cause, as shown in Fig. 30, the marking bar a to have a size different from that of the other marking bars b,.... Concrete operations in this case will be described. Information such as color and shape of the marking bars corresponding to the individual consoles is, as described above, stored in the marking bar shape setting area 44 and the marking bar color setting area 45 in the memory 4 (shown

in Fig. 4). It is assumed here that the marking bar of console I is allowed to operate. The main CPU 3 reads out the information about the marking bar corresponding to console I from the marking bar shape setting area 44 and the marking bar color setting areas 45 in which the marking bar of console I is set, applies processing for changing the direction of the marking bar, and stores it again in the marking bar shape setting area 44 and the marking bar color setting area 45 as before. The steps are the same as in the rotating method of the marking bars described above. As a result, the marking bar of console I is directed in a direction different from that of the marking bars of the other consoles. Then, it is assumed that the marking bar of console II is allowed to operate. In this case, the information about the marking bar of console II is read out, together with the information about the marking bar of console II, from the corresponding marking bar shape setting area 44 and the marking bar color setting area 45. Processing for changing the direction is applied to the marking bar of console II, and simultaneously, the marking bar of console I is brought back to the usual direction, and the information is stored again in the respective marking bar shape setting area 44 and marking bar color setting area 45. As a result, only the marking bar corresponding to console II is directed in a direction different from that of

the other marking bars. It is also possible to change the size of the marking bar for the presenter (allowed to operate) in a similar manner.

As described above, the electronic information blackboard of this embodiment selects an arbitrary one from among a plurality of consoles and adopts it as a center console. Control operations such as "setting of priority" and "setting of limiting conditions" of the other consoles (sub-consoles) can be conducted through this center console. A plurality of consoles can have respectively unique marking bars, and set different features such as color and shape for their respective marking bars. It is consequently possible to clearly discriminate a plurality of marking bars from each other on the display screen, thereby eliminating the risk of misidentification of the marking bars. In addition, visual identifiability of the presenter's marking bar can be raised over that of the other marking bars through a special processing. Information displayed cannot be erased by any console other than the console having entered it and the center console, thus avoiding unauthorized erasure of necessary information.

As a result, when holding a conference by using the electronic information blackboard of this embodiment, smooth progress of the conference is ensured.

While the electronic information blackboard of this

embodiment is used after setting any of the consoles as a center console (second input means), a center console may be fixed in advance.

[Advantages]

The information display apparatus of the present invention, having the configuration as described above, has a high visual identifiability of the indicating means during operation. For example, when using the apparatus in a conference, communication of the intent of the presenter is easier and smooth progress of the conference is ensured by using this indicating means of a high visual identifiability for the presenter.

4. Brief Description of the Drawings

Figs. 1 to 30 are drawings for describing an embodiment of the present invention: Fig. 1 is a block diagram illustrating the configuration of the electronic information blackboard; Fig. 2 is an exterior perspective view of the electronic information blackboard; Fig. 3 illustrates the positional relationship between the display unit and the coordinate input unit; Fig. 4 is a descriptive view illustrating a memory map; Fig. 5 is a block diagram illustrating the system configuration of the electronic information blackboard; Fig. 6 illustrates an example of display of the display unit; Fig. 7 a flowchart illustrating the determining operation of the center console; Fig. 8 is a

descriptive view of the memory area which stores a status flag of the console; Fig. 9 is a descriptive view of the limiting conditions setting screen; Fig. 10 is a flowchart illustrating the setting operation of limiting conditions and priority; Fig. 11 is a descriptive view of the memory area storing a status flag of limiting conditions; Fig. 12 is a descriptive view of the priority setting screen; Fig. 13 is a descriptive view of the memory area storing the status flag of priority; Fig. 14 is a flowchart illustrating the operation when selecting one from among a plurality of operation requests; Fig. 15 is a descriptive view of the erasure menu screen of the center console; Fig. 16 illustrates superposed display of image information and a marking bar; Fig. 17 illustrates movement of the marking bar; Fig. 18 is a descriptive view of the marking bar setting screen; Fig. 19 is a descriptive view of the memory area storing shape information of the marking bar; Fig. 20 is a descriptive view of the memory area storing color information of the marking bar; Fig. 21 is a descriptive view of the marking bar color forming menu screen; Fig. 22 illustrates the limited area of RGB space; Figs. 23 and 24 illustrate examples of display showing correspondence between the marking bar and the console; Fig. 25 illustrates an example of display in which marking bars are displayed in superposition; Fig. 26 illustrates an example of display in

which superposition of marking bars is minimized; Fig. 27 illustrates a method for rotating the marking bar; Fig. 28 illustrates a change in brightness of the marking bar; Fig. 29 illustrates an example of display in which the presenter's marking bar is directed in a different direction for display; Fig. 30 illustrates an example of display in which the presenter's marking bar is changed in size for display; and Fig. 31 illustrates an example of display of the marking bar of the conventional information display apparatus.

A: Main board
B: Console
1: Display unit
2: Coordinate input unit
3: Main CPU
4: Memory
5: Display memory
18, 19: Console interface

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FIG. 1

1: DISPLAY UNIT

2: COORDINATE INPUT UNIT

3: CPU

4: MEMORY

5: DISPLAY MEMORY

6: COMMUNICATION/ARITHMETIC UNIT

7: FDD I/F

8: FDD UNIT

9: SCANNER I/F

10: SCANNER UNIT

11: HARD COPY I/F

12: HARD COPY UNIT

13: COMMUNICATION I/F

15: INPUT PEN

16: AUDIO I/F

17: SPEAKER

18: CONSOLE I/F

19: CONSOLE I/F

20: DISPLAY UNIT

21: KEYBOARD

22: COORDINATE INPUT UNIT

23: CPU

24: MOUSE

25: DISPLAY MEMORY

Fig. 4

4: PROGRAM AREA

41: CENTER CONSOLE SETTING AREA

42: LIMITING CONDITIONS SETTING AREA

43: PRIORITY SETTING AREA

44: MARKING BAR SHAPE SETTING AREA

45: MARKING BAR COLOR SETTING AREA

(1) WORK AREA

FIG. 5

(1) MAIN BOARD

(2) CONSOLE B

(3) CONSOLE B

(4) CONSOLE B

(5) WORKSTATION

FIG. 6

(1) COLOR SPECIFICATION

(2) MODE

(3) ERASING

(4) STORING

(5) COPY

(6) READ

(7) COMMUNICATION

(8) UTILITY

FIG. 7

STEP 2: HAS CENTER CONSOLE DECISION BEEN ENTERED?

STEP 5: CONSOLE n IS SELECTED AS CENTER CONSOLE

FIG. 8

CONSOLE NO.

FIG. 9

(1) SETTING OF LIMITING CONDITIONS

(2) CONSOLE NO.

(3) WRITE ONTO SCREEN

(4) CONTROL OF DISPLAY SCREEN

(5) OPERATION OF MARKING BAR

(6) SELECT CONSOLE TO BE SET BY KEYS ↑↓←→. ENTER o OR x FROM KEYBOARD.

FIG. 10

STEP 1: SELECT CONSOLE

STEP 2: SETTING FOR WRITE ONTO SCREEN

STEP 3: SETTING FOR CONTROL OF DISPLAY SCREEN

STEP 4: SETTING FOR OPERATION OF MARKING BAR

STEP 5: HAS CHECKING OF ALL CONSOLES BEEN COMPLETED?

FIG. 11

(1) CONSOLE NO.

(2) WRITE ONTO SCREEN

(3) CONTROL OF DISPLAY SCREEN

(4) OPERATION OF MARKING BAR

FIG. 12

(1) SETTING OF PRIORITY

(2) CONSOLE NO.

(3) WRITE ONTO SCREEN

(4) CONTROL OF DISPLAY SCREEN

(5) OPERATION OF MARKING BAR

(6) SELECT CONSOLE TO BE SET BY KEYS ↑↓←→.
INPUT PRIORITY FROM KEYBOARD.

FIG. 13

(1) WRITE ONTO SCREEN

(2) CONTROL OF DISPLAY SCREEN

(3) OPERATION OF MARKING BAR

(4) CONSOLE 1
CONSOLE 2
CONSOLE 3
.
.
CONSOLE 8

(5) CONSOLE 1

CONSOLE 2

CONSOLE 3

.

.

CONSOLE 8

(6) CONSOLE 1

CONSOLE 2

CONSOLE 3

.

.

CONSOLE 8

FIG. 14

STEP 1: OPERATION REQUEST IS ISSUED FROM CONSOLE N HAVING PRIORITY n

STEP 2: ARE THERE OPERATION REQUESTS FROM OTHER CONSOLES?

STEP 4: OPERATION REQUEST IS ISSUED FROM CONSOLE M HAVING PRIORITY m

STEP 6: OPERATION OF CONSOLE NO. N IS EXECUTED

STEP 7: OPERATION OF CONSOLE NO. N IS COMPLETED

FIG. 15

(1) ERASE SELECTION MENU

(2) 1. CONSOLE NO. 1 7. CONSOLE NO. 7

2. CONSOLE NO. 2
3. CONSOLE NO. 3
4. CONSOLE NO. 4
5. CONSOLE NO. 5
6. CONSOLE NO. 6
8. CONSOLE NO. 8
10. MAIN BOARD
20. AREA-SPECIFIED ERASURE
30. WHOLE SCREEN ERASURE

(3) SELECT OBJECT OF ERASURE BY KEYS ↑↓←→.
PRESS ENTER KEY.

FIG. 18

(1) MARKING BAR SETTING MENU
(2) RED
(3) BLUE
(4) YELLOW
(5) GREEN
(6) PURPLE
(7) BLACK
(8) LIGHT BLUE
(9) BROWN
(10) COLOR FORMATION
(11) SELECT SHAPE AND COLOR OF MARKING BAR BY KEYS ↑↓←→.
FINALIZE SELECTION BY PRESSING ENTER KEY.

FIG. 19

CONSOLE NO. 1 CODE INFORMATION OF MARKING BAR SHAPE
CONSOLE NO. 2 CODE INFORMATION OF MARKING BAR SHAPE

CONSOLE NO. 3 CODE INFORMATION OF MARKING BAR SHAPE

CONSOLE NO. 8 CODE INFORMATION OF MARKING BAR SHAPE

FIG. 20

CONSOLE NO. 1 CODE INFORMATION OF R VALUE

CODE INFORMATION OF G VALUE

CODE INFORMATION OF B VALUE

CONSOLE NO. 2 CODE INFORMATION OF R VALUE

CODE INFORMATION OF G VALUE

CODE INFORMATION OF B VALUE

CONSOLE NO. 8 CODE INFORMATION OF R VALUE

CODE INFORMATION OF G VALUE

CODE INFORMATION OF B VALUE

FIG. 21

(1) MARKING BAR COLOR FORMING MENU

(2) CURRENT COLOR

(3) SET COMPONENT AMOUNT BY KEYS ↑↓←→.

FINALIZE SETTING BY ENTER KEY.

FIG. 23

(1) SALES SCHEDULE FOR THIS TERM

APR-MAY 00ΔΔ

Jun-

Jul-

(2) SALES

(3) SALES TRANSITION

1990s: 4320000000000

OVER A YEAR AGO: 132%

(4) COMPONENT RATIO

(BY REGION)

(BY PRODUCT)

(5) COLOR SPECIFICATION

(6) MODE SPECIFICATION

(7) ERASURE

(8) STORING

(9) COPY

(10) READ

(11) COMMUNICATION

(12) UTILITY

(13) YEAR

FIG. 24

(1) SALES SCHEDULE FOR THIS TERM

APR-MAY 00ΔΔ

JUN-

JUL-

(2) SALES

(3) SALES TRANSITION

1990s: 4320000000000

OVER A YEAR AGO: 132%

(4) COMPONENT RATIO

(BY REGION)

(BY PRODUCT)

(5) COLOR SPECIFICATION

(6) MODE SPECIFICATION

(7) ERASURE

(8) STORING

(9) COPY

(10) READ

(11) COMMUNICATION

(12) UTILITY

(13) YEAR

(14) ICHINOSE

(15) NIKAIDO

(16) MITAKA

(17) YOTSUYA

(18) GODAI

(19) ROPPONGI

(20) NANAO

(21) YATSUGAMI

FIG. 25

(1) SALES SCHEDULE FOR THIS TERM

APR-MAY 00ΔΔ

JUN-

JUL-

(2) SALES

(3) SALES TRANSITION

1990s: 4320000000000

OVER A YEAR AGO:

(4) COMPONENT RATIO

(BY REGION)

(BY PRODUCT)

(5) COLOR SPECIFICATION

(6) MODE SPECIFICATION

(7) ERASURE

(8) STORING

(9) COPY

(10) READ

(11) COMMUNICATION

(12) UTILITY

(13) YEAR

FIG. 26

(1) SALES SCHEDULE FOR THIS TERM

APR-MAY 00ΔΔ

JUN-

JUL-

(2) SALES

(3) SALES TRANSITION

1990s: 4320000000000

OVER A YEAR AGO: 321%

(4) COMPONENT RATIO

(BY REGION)

(BY PRODUCT)

(5) COLOR SPECIFICATION

(6) MODE SPECIFICATION

(7) ERASURE

(8) STORING

(9) COPY

(10) READ

(11) COMMUNICATION

(12) UTILITY

(13) YEAR

FIG. 27

90: AFFINE CONVERTING UNIT

44: MARKING BAR SHAPE SETTING AREA

FIG. 29

(1) COLOR SPECIFICATION

(2) MODE SPECIFICATION

(3) ERASURE

(4) STORING

(5) COPY

(6) READ

(7) COMMUNICATION

(8) UTILITY

FIG. 30

(1) COLOR SPECIFICATION

(2) MODE SPECIFICATION

(3) ERASURE

(4) STORING

(5) COPY

(6) READ

(7) COMMUNICATION

(8) UTILITY

FIG. 31

(1) SALES AMOUNT